



The Benefits of Modular Construction

By Devin M. Reffitt

Modular Building Techniques Establish State-of-the-Art Dialysis Treatment Centers in Record Time

Anationwide surge in healthcare facility construction is being fueled by an increase in the number of patients, changing patient demographics and the need for updated facilities. Specifically, ancillary medical service centers are current hotbeds for new construction, with new renal care and dialysis treatment centers a particular area of growth. Time to occupancy is a critical factor for healthcare facility planners who require clinics to be open and ready for patients promptly. In addition to new facilities, existing dialysis treatment centers are being upgraded or renovated to accommodate additional stations for increased patient loads as well as additional space for home dialysis and peritoneal dialysis (PD) programs.

When time to occupancy is a critical consideration, accelerated or “fast-track” construction is a highly desirable building option. Modular construction is proving to be an outstanding choice for many outpatient medical services. Modular building differs from traditional building methods because specific scopes of work occur simultaneously rather than in sequence, reducing the overall time to completion. Today, many dialysis treatment facility planners are opting to take the accelerated, or concurrent, construction route as it not only yields a faster time to occupancy, but offers significant financial benefits over the life of the building as well as flexibility.

Overview of Modular Construction

The speed with which a building is completed is the key advantage of modular construction. Because site preparation and module fabrication processes occur simultaneously, the overall project construction timeline is decreased by 30 to 50 percent. Modular construction has to adhere to the same building code requirements as traditional construction methods, and the same building materials and standards are utilized to fabricate each module. All modules meet the building, safety and occupancy code requirements (typically International Building Code) and in many instances, modular buildings exceed local building specifications. Designs are flexible, expandable and easily reconfigured, so they may be adapted to meet the changing needs of the healthcare facility over time. Their durable, secure and relocatable characteristics make them ideal for both temporary and permanent applications that will meet the requirements of healthcare organizations over a longer time horizon.

The old “square box” or “cookie-cutter” building analogy no longer applies to today’s modular buildings. Today, designers and builders have much more flexibility to design using the highest quality materials and finishes. They are not limited or forced to compromise aesthetics for overall space or time efficiencies.

Modules and building components are built in a controlled environment, therefore mitigating risks to the project due to volatile weather, material shortages, theft and vandalism. Prefabricated components and modules are built in a factory and installed onsite to expedite assembly time and create less disruption to the site environment during the installation phase. This differs from conventional construction by minimizing noise and debris from the existing patient services and creating a safer work and patient environment during construction. The interior finishes can be selected from a variety of options and are consistent with those of conventional construction methods. Facility planners can easily

choose from existing blueprints for examination rooms, patient treatment areas, nurses’ stations and waiting rooms; or the building modules can be constructed in accordance with their already established design criteria.

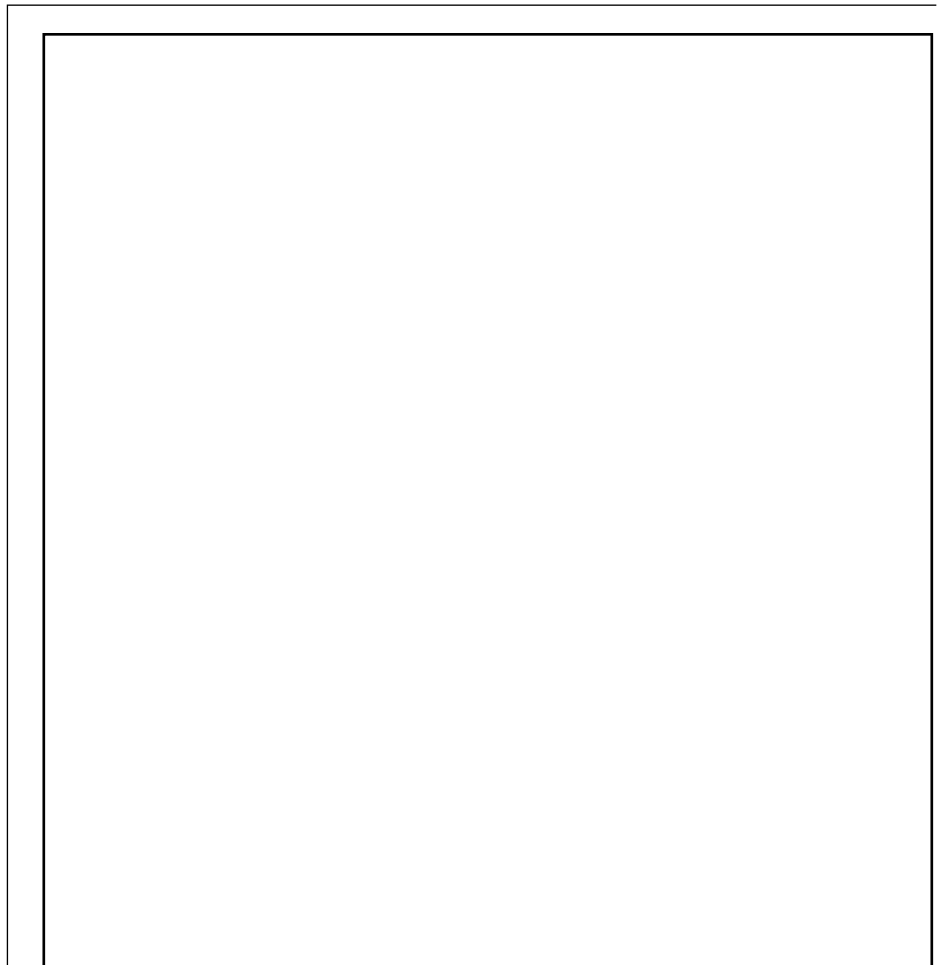
Modular construction enhances quality assurance because QA is built into every step of the process. Quality control is assured with multiple inspections performed at each phase. The building components are inspected and approved by third-party inspectors who are usually agents of the state, not the locality.

This unique building technique enhances quality and simplifies logistics on the job site. Scheduling, trade coordination and construction sequences are all streamlined. Modular methodologies build technical innovation into a repeatable construction process that utilizes proven, standardized practices and process efficiencies. The result is greater reliability and higher quality than conventional site-built construction projects, particularly in areas where a skilled labor force is unavailable. This process truly exemplifies the philosophies of “best practices.”

Many modular healthcare structures have been recognized for their design excellence, as architects and interior designers often work closely with modular consultants and manufacturers to ensure optimum design outcomes for the client. Again, the days of the boring boxy structure are long gone. Permanent modular buildings can be built as single one-story structures or intricate multiple-story buildings.

When it comes to the internal space, interior designers and architects collaborate with the client to develop the architectural interior finishes and patient and workflow environments that are consistent for each medical application. Designs can be altered for specific services. For example, considerations are made for additional floor loading, and provisions are incorporated into building design to accommodate the weight of heavy dialysis water treatment equipment in dialysis treatment centers. Depending on the client’s needs, the modular builder can be responsible for just a few or all of the prefabricated interiors of the modules.

Lastly, the new or renovated structure can be designed to correspond with the surrounding environment and existing buildings and hospitals. Exterior architectural





The building sections are manufactured in a factory-controlled setting while the building's site is simultaneously prepared.

finishes, such as brick, stucco and exposed aggregate architectural panels, can complement those of neighboring buildings on the healthcare campus.

Modular Building Guidelines for Dialysis Treatment Centers

Dialysis treatment centers have their own special set of considerations. First and foremost, they have to accommodate many different people – patients, technicians, physicians, nurses and office staff. As such, the needs of each group should be addressed when considering the layout for a new modular treatment facility and as many people as possible should be engaged to express specific requirements.

Following are suggested design guidelines for highly functional dialysis treatment centers providing outstanding patient comfort.

Number of stations: Determining the number of stations for the treatment facility should be based upon the patient community, functional program and a consideration of the number of shifts that will be performed each day. “Efficiencies of scale” may also be considered with the future economics of treatment station expansion.

Patient changing rooms: All patient areas should include secured lockers to ensure a safe place for patients to store their belongings while undergoing treatment.

Examination rooms: A sink for hand-washing and writing surfaces should be provided within at least 100-square-foot of space in each examination room. This is in accordance with the American Institute of Architects (AIA) guidelines for the design and construction of acute and chronic renal dialysis centers.

Dialysis stations/patient treatment areas: Treatment areas should be open and separate from administrative and waiting areas. An open unit with individual partitions provides privacy for each patient. In accordance with the above-mentioned AIA guidelines, individual treatment areas should be at least 80 square feet, with a four-foot space between bed and/or lounge chairs. However, many healthcare clients prefer to standardize their requirements for higher square footage in treatment areas. Code requires at least one hand-washing area per four patient stations to provide equal access from each station. Where possible, patient stations should be infused with as much natural light as possible. The space should accommodate televisions, as well as other audio and video media players. Most facility planners implement a centralized hospital video system where individual monitors are provided at each station and are mounted on the dialysis chase, floor-mounted on a swiveling base or recessed into the ceiling system. The “in-

processing” area is usually incorporated into the treatment floor for patients entering into the area to be dialyzed, where patients are weighed via an in-floor or movable scale.

Medical stations: Staff stations should be located in the dialysis treatment areas to provide visual observation of all patients. Hand-washing facilities should be convenient to the medical stations. If required, a medication dispensing station can be included in the design, along with a work counter. Provisions should be made for controlled storage, preparation distribution and refrigeration of medications.

Isolation rooms: If necessary, airborne infection isolation rooms should be built into the center’s design. The number of such rooms is determined by an infection control risk assessment. This accommodation can range from a wall separating the area from the remainder of the treatment floor to an actual enclosed room with negative pressure airflow provisions. In either instance, a separate hand-washing sink is provided within the isolation area.

Patient/family training rooms: If home dialysis training or PD programs are being accommodated, a private area of at least 120 square feet is recommended for each program. This room should contain a counter, hand-washing facilities and a separate drain for fluid disposal.

Medical work rooms: Work rooms should include a work counter, hand-washing sink and storage facilities for sterilized supplies. Both soiled and clean workrooms should be included in the design, but separate with no direct connection. A soiled workroom should contain a flushing-rim sink, hand-washing sink, a work counter, storage cabinets, waste and soiled linen receptacles.

Water treatment room: The reverse osmosis (RO)/water filtration systems require ample space to operate effectively. Space requirements for such systems should be factored into the overall design plans. The purified water source is the central point of a hemodialysis treatment center. Consultation with a water treatment company should be considered to identify any electrical disconnects, mixing valves and floor sinks. Heavy water storage tanks as well as bi-carb and acid tanks will be located in this area and flooring should be designed to withstand such equipment. Due to standing water potential, a durable/water accommodating floor surface should be used in this space, such as epoxy-coated seamless floor products. In accordance with building codes, this area is required to be located in an enclosed room.

Administrative offices: Administrative staff offices should be separate from patient care spaces and designed according to the anticipated number of employees. In many instances a viewing window is installed to give staff, and especially the unit manager, a view of the activities on the treatment floor. For this reason, some units place the manager’s office adjacent to the treatment floor.

Restrooms: Every facility must have a private patient toilet with hand-washing facilities.

Kitchens and nourishment stations: The food area should include a sink, work counter, refrigerator, storage cabinets and equipment for serving beverages. Patients and staff often prefer to have access to ice and as a result many facilities elect to install a commercial ice machine in the nourishment area.

Storage areas: Supply carts should be easily accessible to staff members. Storage space should be provided for wheelchairs

and stretchers and located out of the direct line of foot traffic. A clean line storage area should be included, cloaked in a clean workroom, in a separate closet, or in an approved distribution system. If a closed cart system is used, storage can be located in an alcove and away from normal foot traffic and under staff control. Many units are designed and constructed to incorporate storage space within the nurses' station/medical stations to provide for greater efficiencies and greater use of space.

Reprocessing room: If dialyzers are reused, a reprocessing room is required to perform one-way flow of materials from soiled to clean. The size of the area should be large enough to accommodate refrigeration of dialyzers, decontamination and cleaning areas, sink processors, computer processors and label printers, packaging area and dialyzer storage cabinets as well as proper ventilation of the room for the reprocessing process (providing negative pressure to the adjoining areas with 100 percent exhaust air to the outside).

Environmental services closet: Located adjacent to the dialyzer, this closet should contain a floor receptor, service sink and storage space for housekeeping supplies and equipment and be used only for dialyzers.

Equipment repair room/work room: If required by the functional program, an equipment repair and breakdown room is equipped with a hand-washing facility, a deep service sink, a work counter and storage cabinet, used typically for repair and service of dialysis machines while serving as an office for the unit technician. The technician will require space for various manuals as well as dialysis boxes in continuous loop with reverse osmosis (RO)/water treatment system.

Step-by-Step Process

Specific steps should be followed when planning and building dialysis treatment centers using modular construction methods:

Step One: Define the need. Engage a team that includes the client, builder, architect and modular construction consultant. At this time it is appropriate to have a short list of site locations (if a site hasn't already been selected) and understand any restrictions pertaining to site set-backs, zoning and "use" permitting. Identify the immediate design and space needs, taking into consideration the architectural features of existing buildings and surroundings. Also consider future needs in terms of extensibility so that additional components can be conceptualized as medical needs change and expand, and accommodations are made for potential future applications. At this point, budget should be determined and financing options, unique to modular construction, explored. In addition to an outright purchase, additional options include lease-purchase programs, conventional lease and other creative financing options. Consulting with accounting and tax professionals regarding the potential accelerated depreciation characteristics of modular structures is recommended.

Step Two: Design. Analyze all requirements specific to dialysis treatment centers and devise a clear strategy and recommendations based on the design and budget. Develop a componentized approach that incorporates value engineering, project efficiencies and alternative module configurations.

Step Three: Apply the concurrent construction process. Conventional construction is a linear process. One step cannot



The modules are shipped to the site and set upon the already prepared foundation with the use of a crane.



The facility is occupied and operational in less than five months.

begin until other steps have been completed. With concurrent construction, critical steps in the construction process occur simultaneously. More than 50 percent of the construction occurs off-site, in a factory-controlled environment. Site work and building preparations including grading, foundations, utilities, paving and some landscaping happen while the building's modules are fabricated in the factory.

Step Four: Deliver and install. Shipment of all modular components is coordinated and completed. Additionally, the majority of the site work, including final grading, utility connections, sidewalks, ramps, stairs and final landscaping is finished. The goal is to create pleasing aesthetics and coordinating exterior elements that establish the facility harmoniously within its setting.

Step Five: Complete the interior finishes and finalize for occupancy. Interior finishes, such as furnishings are completed on-site. Finally, the modular building consultant instructs the client on modular-specific maintenance, planning for future expansion and other specifics while a building inspector conducts final code inspections and approvals.

Considering Modular Construction

Modular building is proving to be an outstanding choice for quality healthcare environments. According to Architectural Record, accelerated construction methods have been employed since the 1960s and now account for an estimated 40 percent of all building projects. The range of modular healthcare buildings existing today attests to the diversity and creativity that modular processes afford. Modular construction is an attractive option to get dialysis treatment centers up and running quickly and efficiently. **RBT**

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